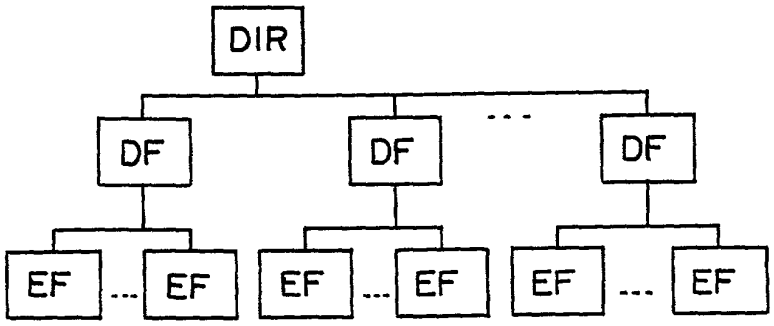


FIG. 1

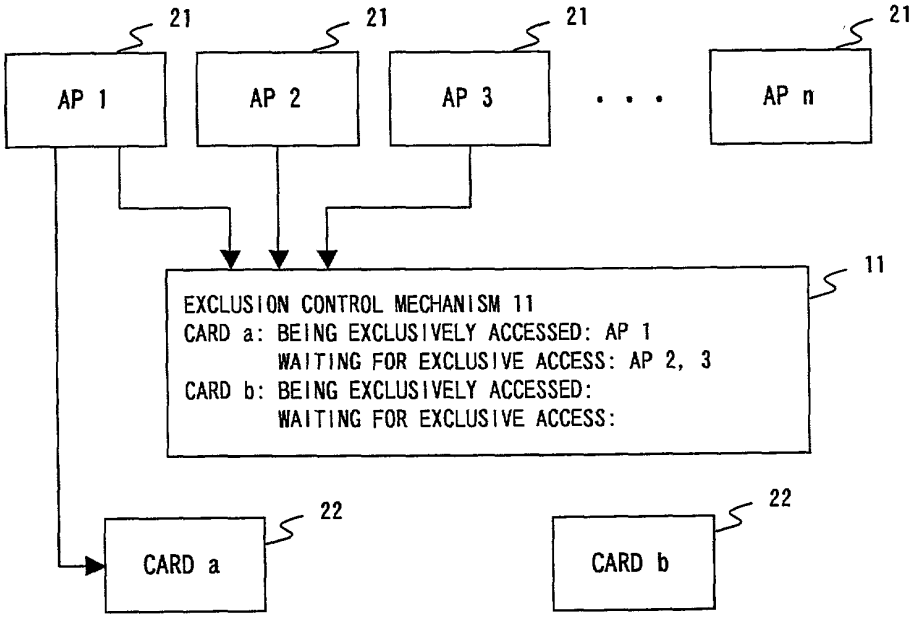

21
21
21
21
AP 1
AP 2
AP 3
. . .
AP n
11
EXCLUSION CONTROL MECHANISM 11
CARD a: BEING EXCLUSIVELY ACCESSED: AP 1
WAITING FOR EXCLUSIVE ACCESS: AP 2, 3
CARD b: BEING EXCLUSIVELY ACCESSED:
WAITING FOR EXCLUSIVE ACCESS:
22
22
CARD a
CARD b

FIG. 2

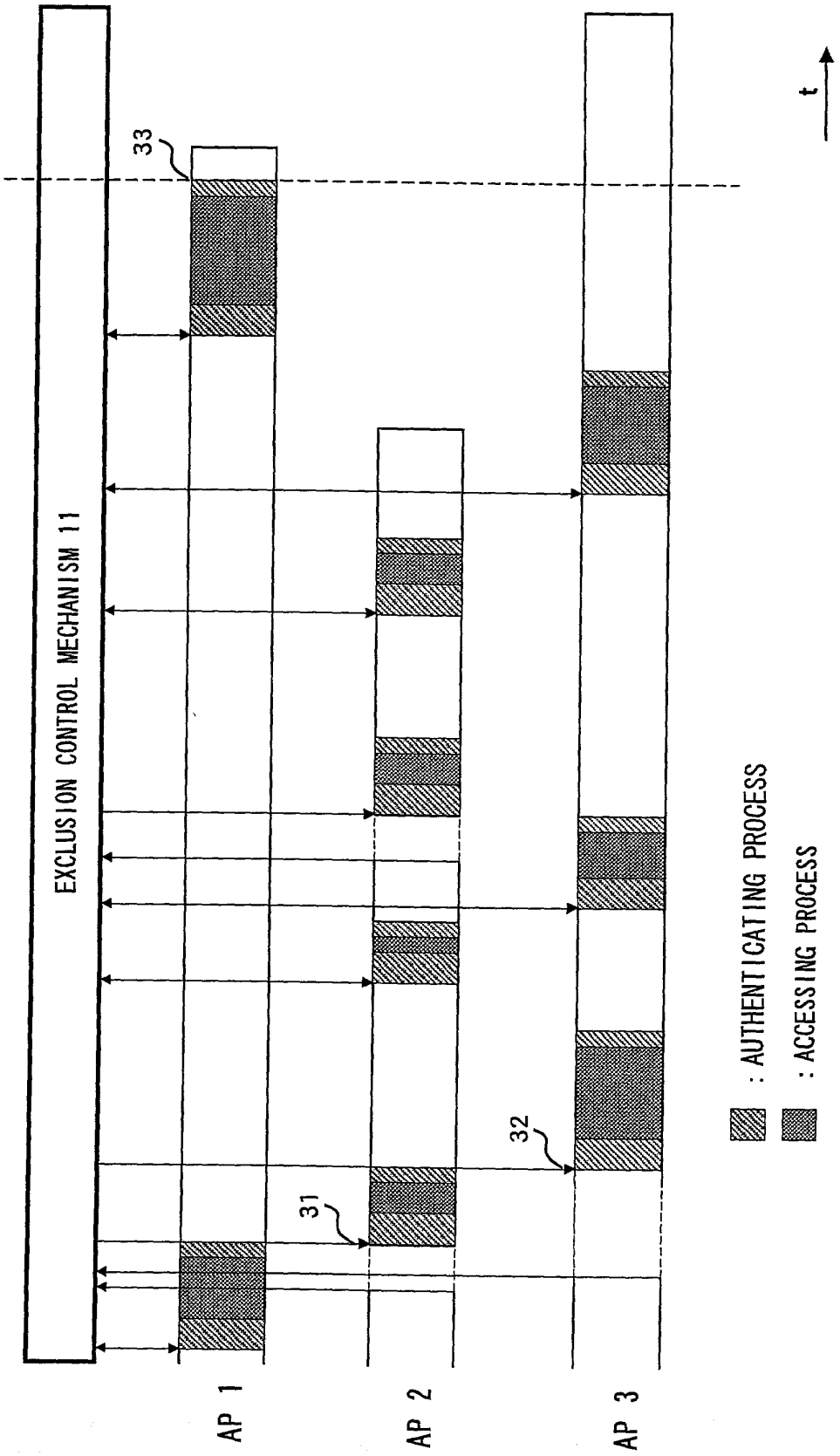

EXCLUSION CONTROL MECHANISM 11
33
31
32
AP 1
AP 2
AP 3
t
: AUTHENTICATING PROCESS
: ACCESSING PROCESS

FIG. 3

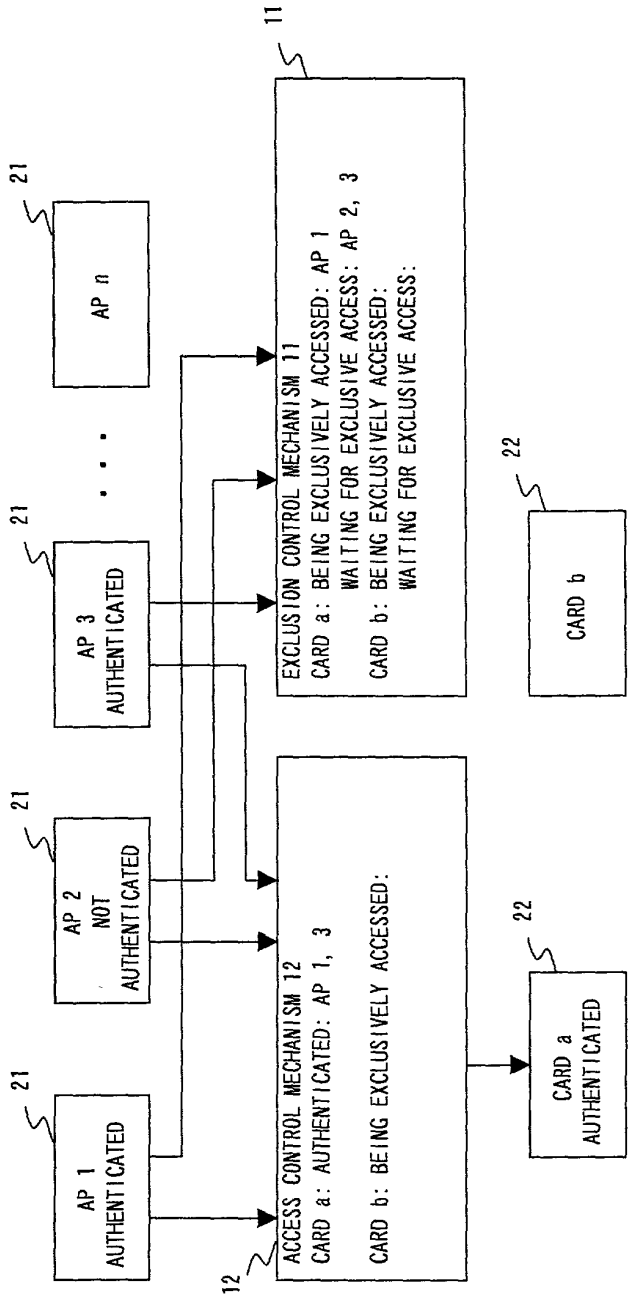

11
EXCLUSION CONTROL MECHANISM 11
CARD a: BEING EXCLUSIVELY ACCESSED: AP 1
WAITING FOR EXCLUSIVE ACCESS: AP 2, 3
CARD b: BEING EXCLUSIVELY ACCESSED:
WAITING FOR EXCLUSIVE ACCESS:
21
AP 1
AUTHENTICATED
21
AP 2
NOT
AUTHENTICATED
21
AP 3
AUTHENTICATED
. . . .
21
AP n
12
ACCESS CONTROL MECHANISM 12
CARD a: AUTHENTICATED: AP 1, 3
CARD b: BEING EXCLUSIVELY ACCESSED:
22
CARD a
AUTHENTICATED
22
CARD b

FIG. 4

AP IDENTIFICATION INFORMATION	AUTHENTICATED CARD INFORMATION	
AP 1	CARD a	CARD b
AP 2		
AP 3	CARD a	
.....	.....	.....
AP n		

FIG. 5

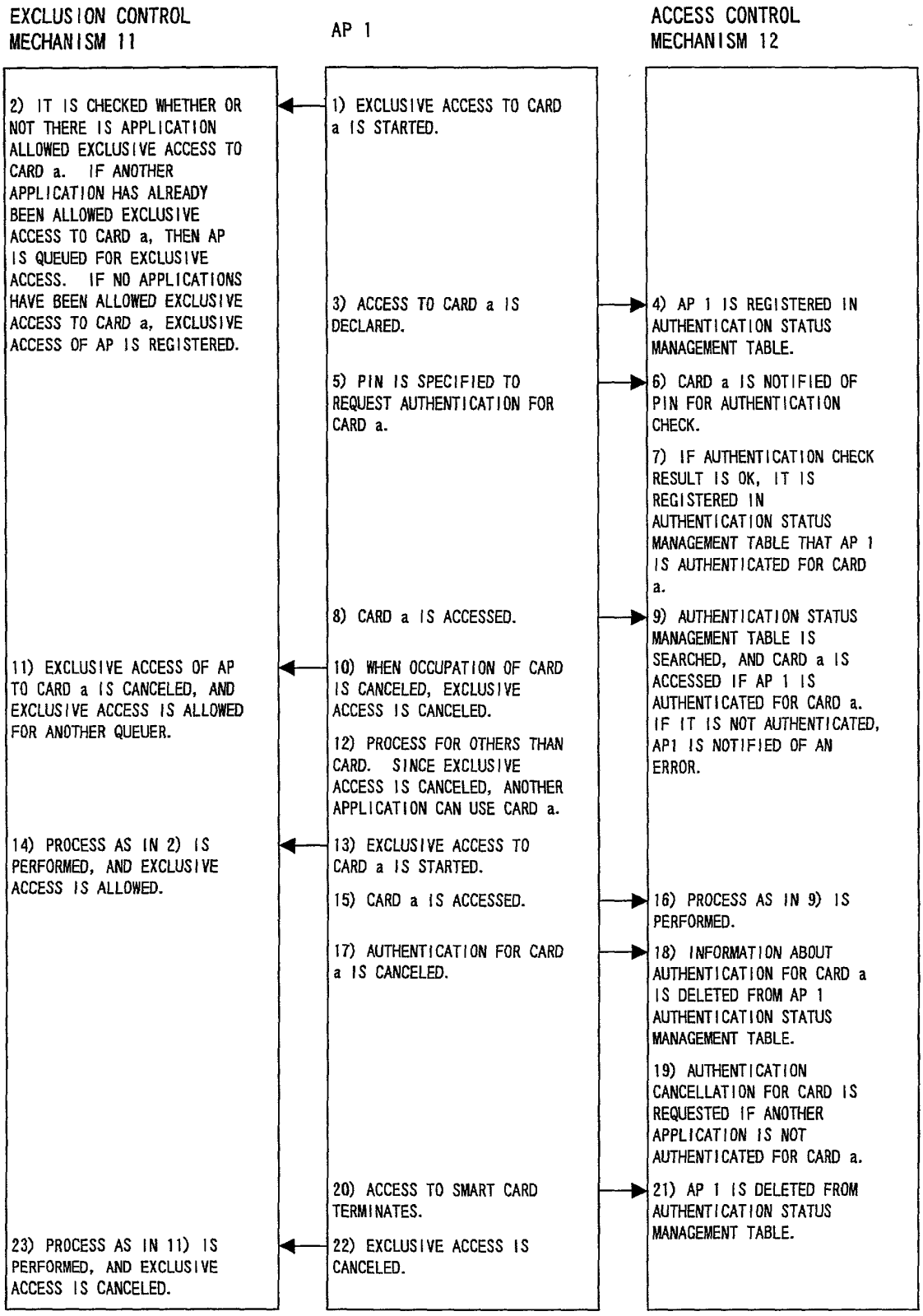
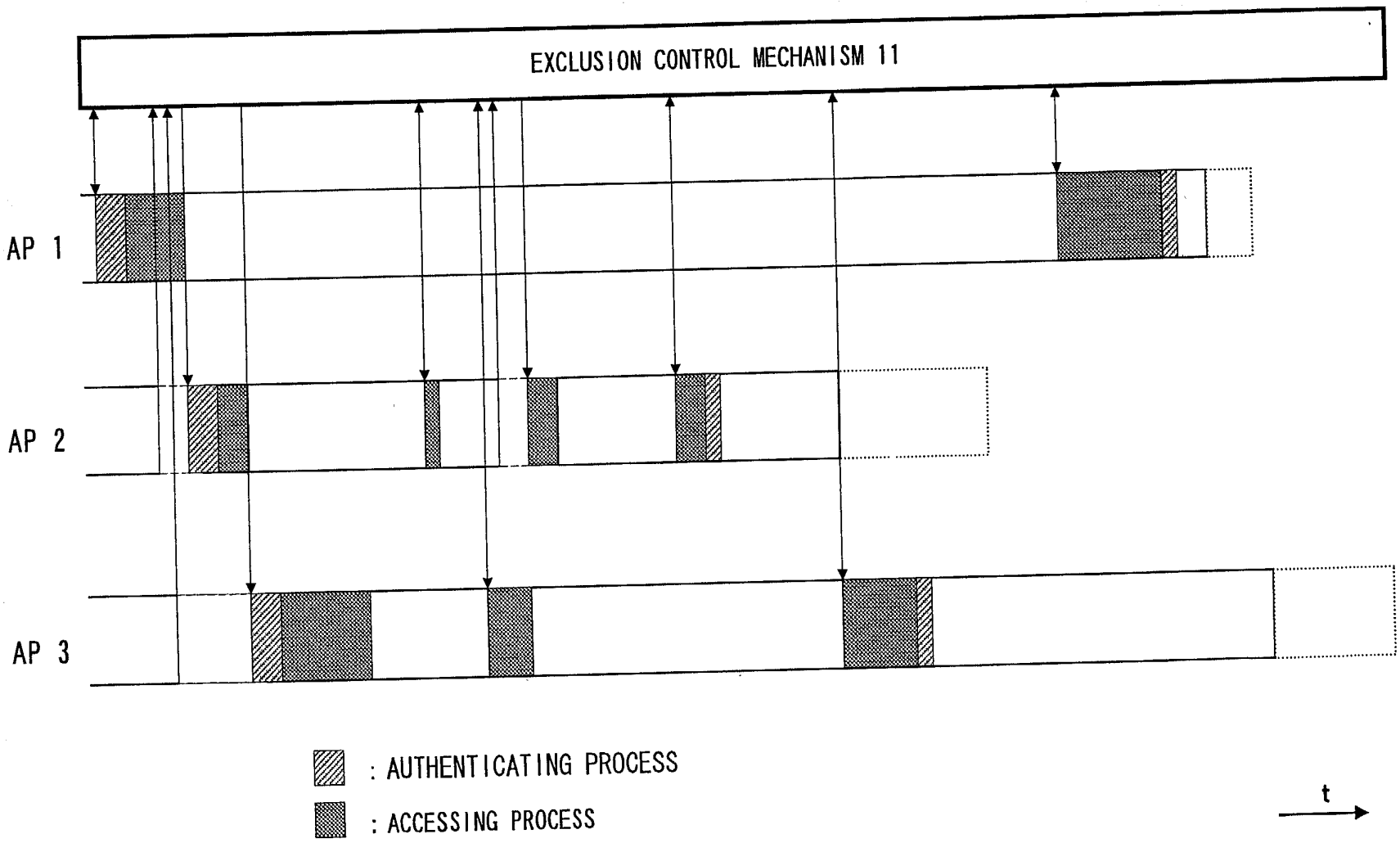

EXCLUSION CONTROL MECHANISM 11
AP 1
ACCESS CONTROL MECHANISM 12
1) EXCLUSIVE ACCESS TO CARD a IS STARTED.
2) IT IS CHECKED WHETHER OR NOT THERE IS APPLICATION ALLOWED EXCLUSIVE ACCESS TO CARD a. IF ANOTHER APPLICATION HAS ALREADY BEEN ALLOWED EXCLUSIVE ACCESS TO CARD a, THEN AP IS QUEUED FOR EXCLUSIVE ACCESS. IF NO APPLICATIONS HAVE BEEN ALLOWED EXCLUSIVE ACCESS TO CARD a, EXCLUSIVE ACCESS OF AP IS REGISTERED.
3) ACCESS TO CARD a IS DECLARED.
4) AP 1 IS REGISTERED IN AUTHENTICATION STATUS MANAGEMENT TABLE.
5) PIN IS SPECIFIED TO REQUEST AUTHENTICATION FOR CARD a.
6) CARD a IS NOTIFIED OF PIN FOR AUTHENTICATION CHECK.
7) IF AUTHENTICATION CHECK RESULT IS OK, IT IS REGISTERED IN AUTHENTICATION STATUS MANAGEMENT TABLE THAT AP 1 IS AUTHENTICATED FOR CARD a.
8) CARD a IS ACCESSED.
9) AUTHENTICATION STATUS MANAGEMENT TABLE IS SEARCHED, AND CARD a IS ACCESSED IF AP 1 IS AUTHENTICATED FOR CARD a. IF IT IS NOT AUTHENTICATED, AP1 IS NOTIFIED OF AN ERROR.
10) WHEN OCCUPATION OF CARD IS CANCELED, EXCLUSIVE ACCESS IS CANCELED.
11) EXCLUSIVE ACCESS OF AP TO CARD a IS CANCELED, AND EXCLUSIVE ACCESS IS ALLOWED FOR ANOTHER QUEUER.
12) PROCESS FOR OTHERS THAN CARD. SINCE EXCLUSIVE ACCESS IS CANCELED, ANOTHER APPLICATION CAN USE CARD a.
13) EXCLUSIVE ACCESS TO CARD a IS STARTED.
14) PROCESS AS IN 2) IS PERFORMED, AND EXCLUSIVE ACCESS IS ALLOWED.
15) CARD a IS ACCESSED.
16) PROCESS AS IN 9) IS PERFORMED.
17) AUTHENTICATION FOR CARD a IS CANCELED.
18) INFORMATION ABOUT AUTHENTICATION FOR CARD a IS DELETED FROM AP 1 AUTHENTICATION STATUS MANAGEMENT TABLE.
19) AUTHENTICATION CANCELLATION FOR CARD IS REQUESTED IF ANOTHER APPLICATION IS NOT AUTHENTICATED FOR CARD a.
20) ACCESS TO SMART CARD TERMINATES.
21) AP 1 IS DELETED FROM AUTHENTICATION STATUS MANAGEMENT TABLE.
22) EXCLUSIVE ACCESS IS CANCELED.
23) PROCESS AS IN 11) IS PERFORMED, AND EXCLUSIVE ACCESS IS CANCELED.

FIG. 6

PCT/JP99/02869



F I G. 7

SMART CARD ACCESS MANAGEMENT SYSTEM, . . .
Takayoshi Kurita
Greer, Burns & Crain, Ltd. (Patrick Burns)
Ref. No. 1503.65307
Sheet 7 of 15
(312) 360 0080

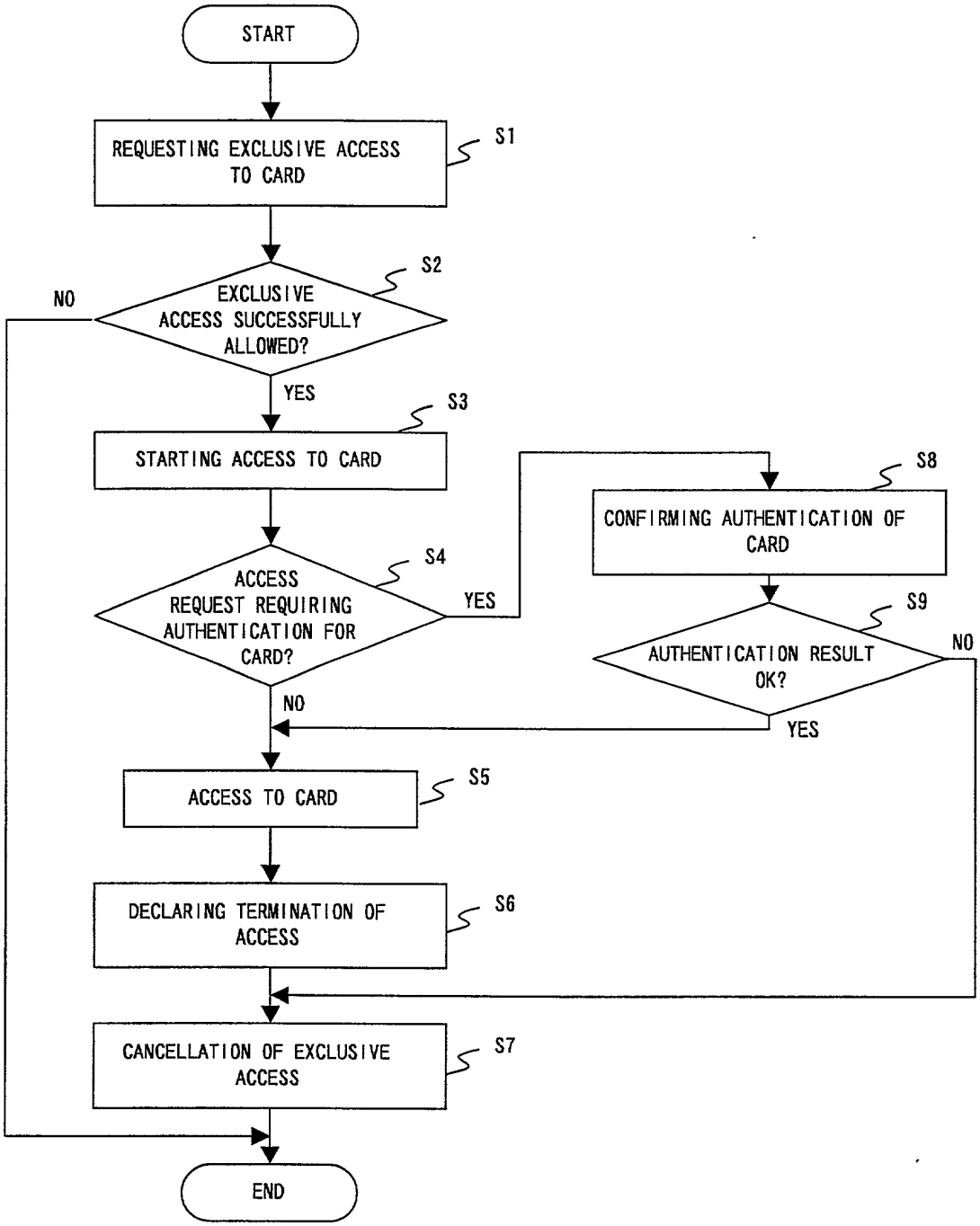

START
REQUESTING EXCLUSIVE ACCESS TO CARD
S1
EXCLUSIVE ACCESS SUCCESSFULLY ALLOWED?
S2
NO
YES
STARTING ACCESS TO CARD
S3
ACCESS REQUEST REQUIRING AUTHENTICATION FOR CARD?
S4
YES
NO
CONFIRMING AUTHENTICATION OF CARD
S8
AUTHENTICATION RESULT OK?
S9
NO
YES
ACCESS TO CARD
S5
DECLARING TERMINATION OF ACCESS
S6
CANCELLATION OF EXCLUSIVE ACCESS
S7
END

FIG. 8

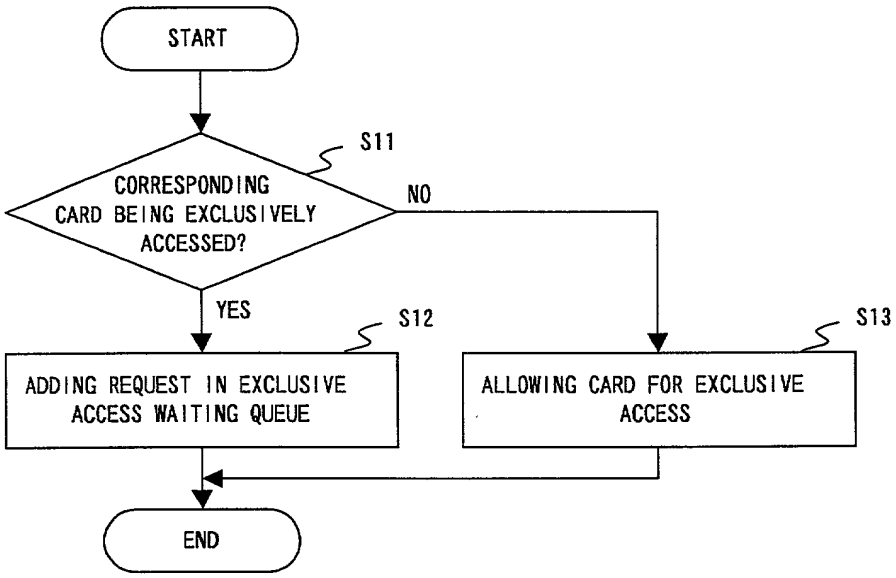

START
S11
CORRESPONDING CARD BEING EXCLUSIVELY ACCESSED?
NO
YES
S12
ADDING REQUEST IN EXCLUSIVE ACCESS WAITING QUEUE
S13
ALLOWING CARD FOR EXCLUSIVE ACCESS
END

FIG. 9

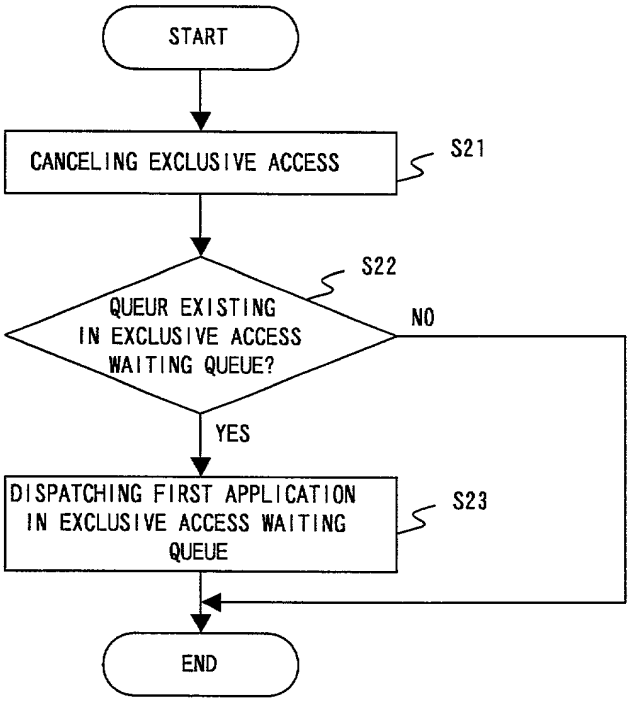

START
CANCELING EXCLUSIVE ACCESS
S21
S22
QUEUR EXISTING IN EXCLUSIVE ACCESS WAITING QUEUE?
NO
YES
DISPATCHING FIRST APPLICATION IN EXCLUSIVE ACCESS WAITING QUEUE
S23
END

FIG. 10

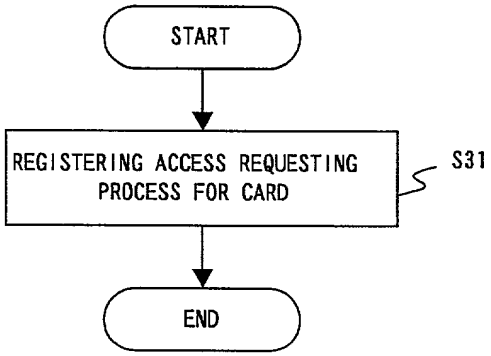

START
REGISTERING ACCESS REQUESTING PROCESS FOR CARD
S31
END

FIG. 11

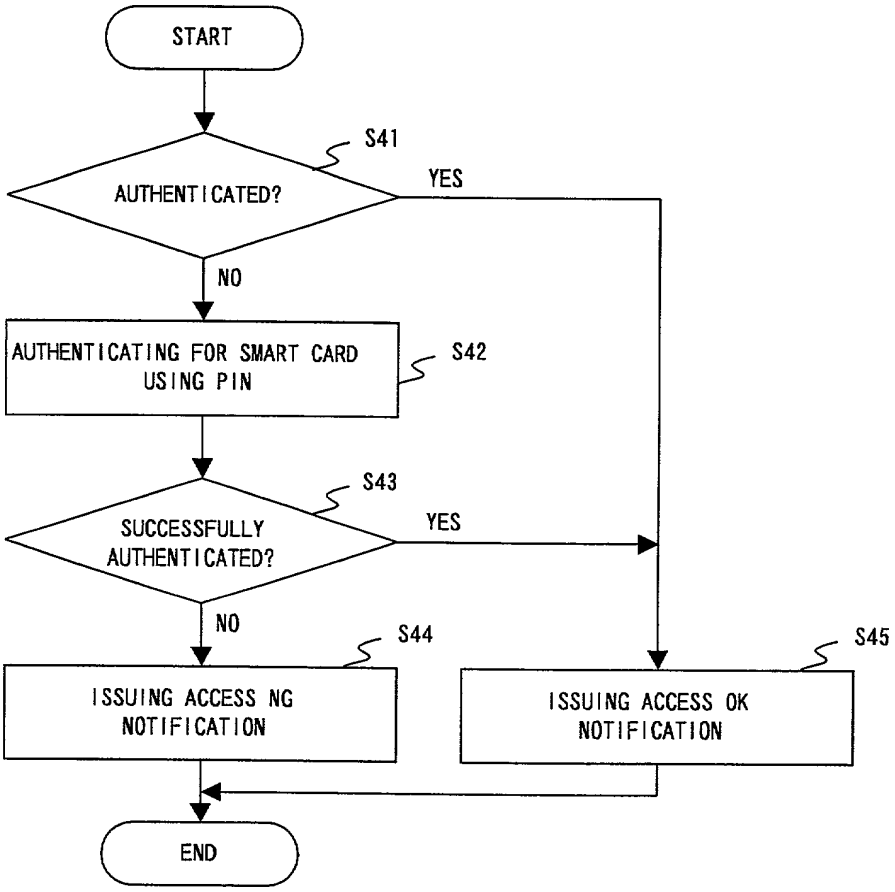

START
S41
AUTHENTICATED?
YES
NO
AUTHENTICATING FOR SMART CARD USING PIN
S42
S43
SUCCESSFULLY AUTHENTICATED?
YES
NO
S44
ISSUING ACCESS NG NOTIFICATION
S45
ISSUING ACCESS OK NOTIFICATION
END

FIG. 12

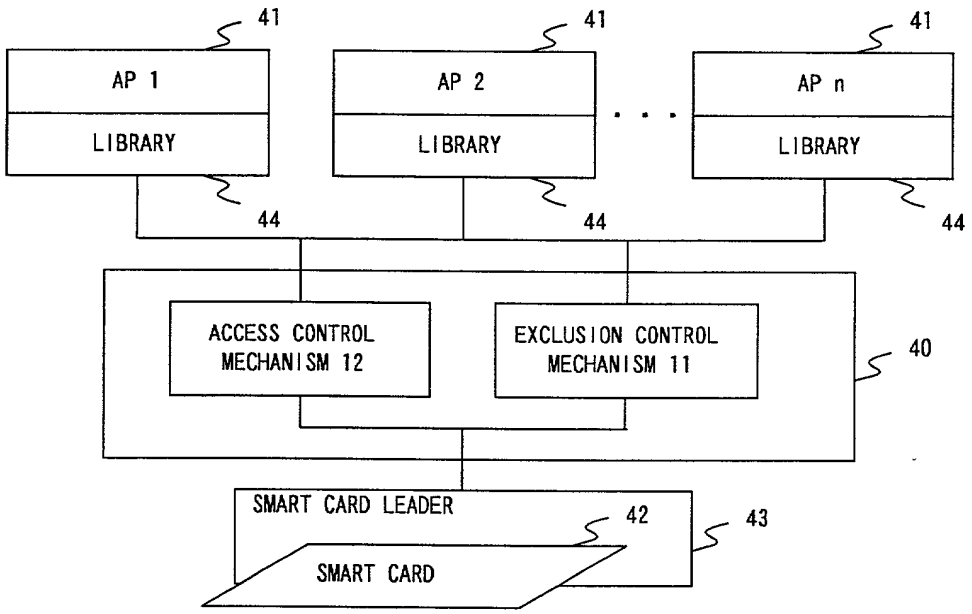

41
41
41
AP 1
AP 2
AP n
LIBRARY
LIBRARY
LIBRARY
44
44
44
ACCESS CONTROL MECHANISM 12
EXCLUSION CONTROL MECHANISM 11
40
SMART CARD LEADER
42
43
SMART CARD

FIG. 13

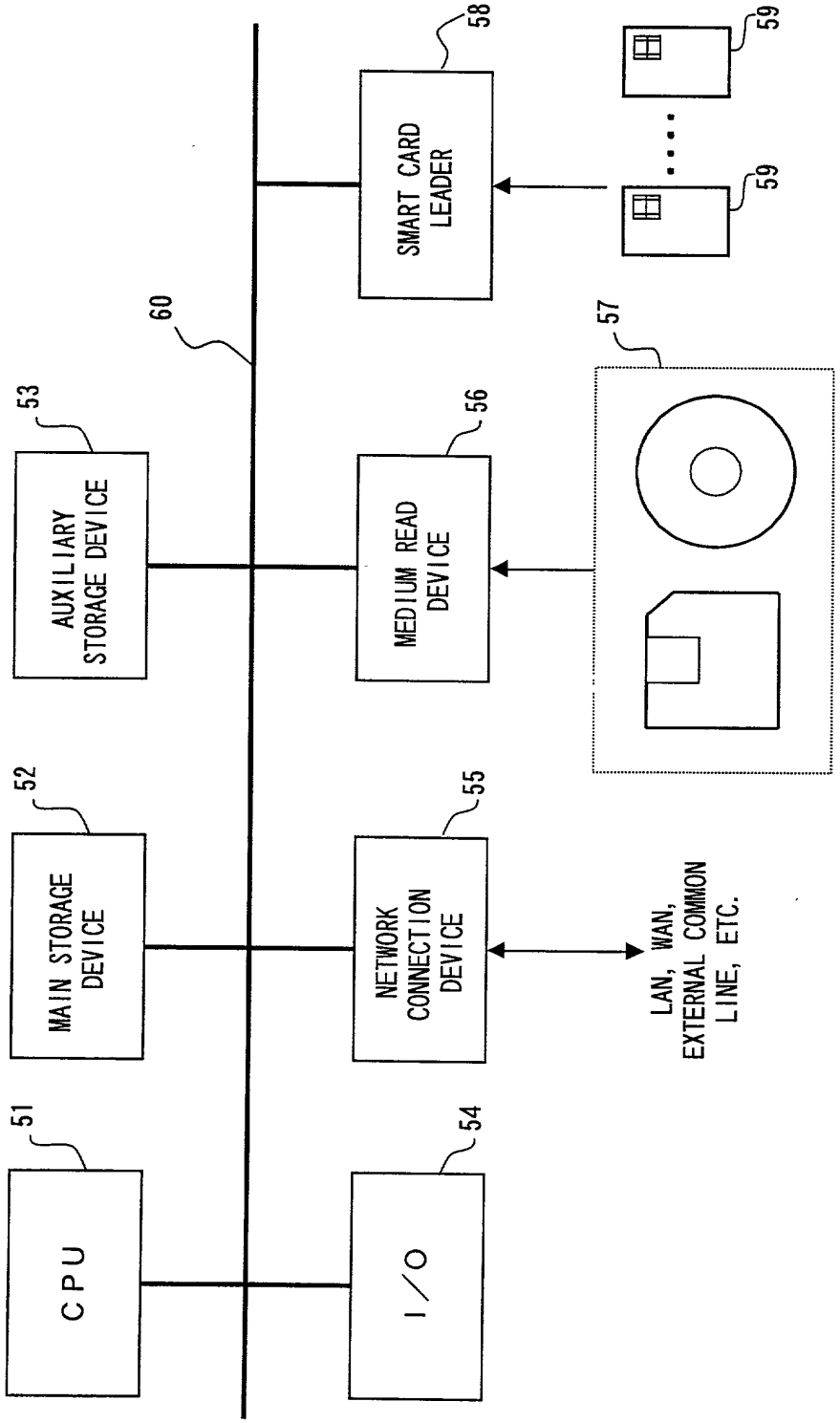

CPU
51
MAIN STORAGE DEVICE
52
AUXILIARY STORAGE DEVICE
53
I/O
54
NETWORK CONNECTION DEVICE
55
MEDIUM READ DEVICE
56
57
SMART CARD LEADER
58
59
59
60
LAN, WAN, EXTERNAL COMMON LINE, ETC.

FIG. 14

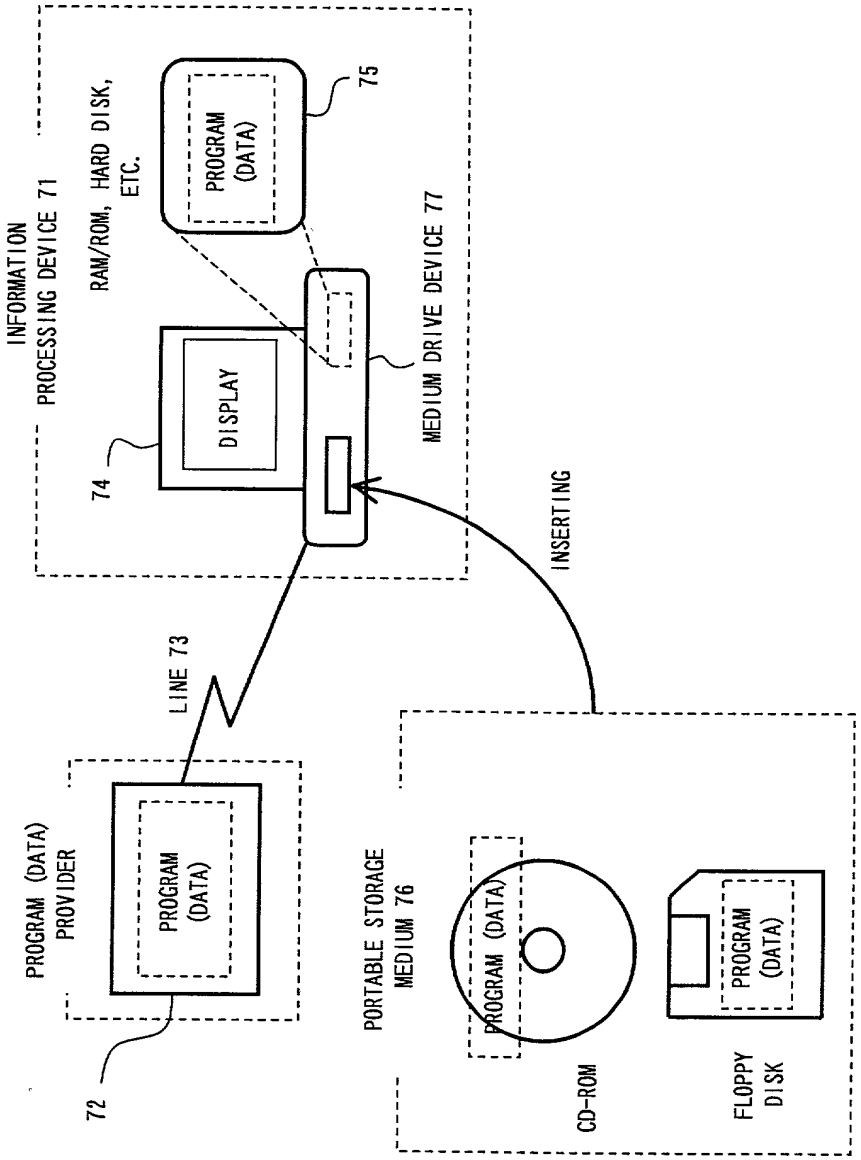

INFORMATION PROCESSING DEVICE 71
RAM/ROM, HARD DISK, ETC.
PROGRAM (DATA)
75
DISPLAY
74
MEDIUM DRIVE DEVICE 77
INSERTING
LINE 73
PROGRAM (DATA) PROVIDER
PROGRAM (DATA)
72
PORTABLE STORAGE MEDIUM 76
PROGRAM (DATA)
CD-ROM
PROGRAM (DATA)
FLOPPY DISK

FIG. 15